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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/786,499	03/02/2001	Michael Hobson	GJE-0004	1435

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EXAMINER	
THOMPSON, JAMES A	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/786,499	HOBSON ET AL.	
	Examiner	Art Unit	
	James A. Thompson	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 26 June 2006 have been fully considered but they are not persuasive.

Regarding page 4, lines 2-20: Applicant's present amendments have been fully considered. Rejections based on the presently amended claims are set forth in detail below. The new grounds of rejection have been necessitated by the present amendments to the claims.

Regarding page 4, lines 22-31: Claims 1-3 and 5-16 still do not conform to the requirements of 35 USC §101. The recited signal is still simply data. The data may be transmitted data, but it is still data. Further, the Office does not recognize a signal *per se* to be statutory since a signal is neither a process, machine, article of manufacture, or composition of matter. The signal itself is simply energy. The data encoded in the signal is simply data. Claims 1-3 and 5-16 are merely mathematical operations that are to be performed on the encoded data. The algorithmic manipulation of data simply for the purpose of generating altered data is not statutory. Furthermore, claims which merely recite applying such a mathematical algorithm to a set of data are an attempt to patent an abstract idea, and thus pre-empt every substantial practical application of the abstract idea, because such a patent in practical effect would be a patent on the idea itself (Benson, 409 U.S. at 71-72, 175 USPQ at 676; cf, Diehr, 450 U.S. at 192,209 USPQ at 10).

Regarding page 4, line 33 to page 8, line 11: Applicant's arguments are directed to the claims as presently amended, and not the claims as filed prior to the previous office action,

mailed 23 March 2006. As such, the present amendments to the claims necessitate the new grounds of rejection that are set forth in detail below.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-3 and 5-16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-3 and 5-16 recite performing mathematical functions on a set of data values encoded in a signal. Mathematical manipulations upon data are not patentable. The data may be transmitted data, but it is still data. Further, the Office does not recognize a signal *per se* to be statutory since a signal is neither a process, machine, article of manufacture, or composition of matter. The signal itself is simply energy. The data encoded in the signal is simply data. Claims 1-3 and 5-16 are merely mathematical operations that are to be performed on the encoded data. The algorithmic manipulation of data simply for the purpose of generating altered data is not statutory. Furthermore, claims which merely recite applying such a mathematical algorithm to a set of data are an attempt to patent an abstract idea, and thus pre-empt every substantial practical application of the abstract idea, because such a patent in practical effect would be a patent on the idea itself (Benson, 409 U.S. at 71-72, 175 USPQ at 676; cf, Diehr, 450 U.S. at 192,209 USPQ at 10). Finally, since the recited claims are

simply mathematical operations upon data to generate a different set of data (reconstructed signal), the claims as presently recited do not provide a *concrete, tangible and useful* result.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-2, 5-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knaell (US Patent 5,394,151) and Spencer (US Patent 5,535,291).

Regarding claim 1: Knaell discloses a method of reconstructing an image from a signal, the image derived from measurements of a physical object characterized by a first prediction function (three-dimensional function of object) representing a predictable effect of an apparatus (column 4, lines 64-66 and column 5, lines 7-10 of Knaell), and a noise function representing unpredictable noise (column 6, lines 60-63 and column 9, lines 23-26 of Knaell), the method comprising the steps of:

- altering an original coordinate basis (three-dimensional) of the object to produce at least one other coordinate basis (column 4, line 64 to column 5, line 10 of Knaell), the at least one other coordinate basis having a plurality of spaces (figure 3A(1,2,3) and column 7, line 64 to column 8, line 2 of Knaell - two-dimensional data acquisition at

each point) with a lower dimensionality than a space within the original coordinate basis (column 5, lines 7-10 of Knaell), the set of data in the at least one other coordinate basis represented by a second prediction function (two-dimensional function) of the signal in the at least one other coordinate basis (column 5, lines 7-18 of Knaell). The original coordinate bases is a three-dimensional coordinate basis since the object measured is a three-dimensional object. Thus, the original data, which is the data corresponding to the object itself, is altered from a three-dimensional coordinate basis to a two-dimensional coordinate basis.

- performing a Bayesian reconstruction (column 6, lines 38-47 of Knaell) utilizing the second prediction function to produce a reconstruction signal (column 6, lines 57-66 of Knaell), the Bayesian reconstruction capable of operation of positive, negative and complex signal values (column 6, lines 47-56 of Knaell). Since positive and negative signal values are simply complex values without an imaginary component, the Bayesian reconstruction is capable of operation of positive, negative and complex signal values (column 6, lines 47-56 of Knaell).
- converting the reconstruction signal back into the original coordinate basis to generate a signal (figure 5B("Display 3-D Image") and column 9, lines 6-14 of Knaell).

Knaell does not disclose expressly that said reconstruction is of a previously produced signal from a given set of data, the set of data characterized by a first prediction function representing a predictable effect of an apparatus on the previously produced signal, and a noise function representing unpredictable

noise contributed to the previously produced signal; that the Bayesian reconstruction utilizes a maximum entropy method; and that said converting generates the previously produced signal.

Spencer discloses:

- reconstructing a previously produced signal from a given set of data (column 5, lines 8-13 and lines 18-25 of Spencer), the set of data characterized by a first prediction function representing a predictable effect of an apparatus on the previously produced signal (column 5, lines 27-36 of Spencer), and a noise function representing unpredictable noise contributed to the previously produced signal (column 6, lines 43-46 of Spencer).
- performing Bayesian reconstruction utilizing a maximum entropy method (column 5, lines 8-10 of Spencer).
- converting the reconstruction signal to generate the previously produced signal (column 4, line 65 to column 5, line 7 of Spencer).

Knaell and Spencer are combinable because they are from the same field of endeavor, namely the conversion and reconstruction of images and signals using Bayesian reconstruction. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a previously produced signal for reconstruction, as taught by Spencer, rather than relying upon direct measurements, as taught by Knaell. Thus, the combined system of Knaell and Spencer would take two-dimensional slices of three-dimensional noisy data, rather than imaging directly from a three-dimensional object. The motivation for doing so would have been to be able to apply the reconstruction technique to already obtained three-dimensional data, rather than applying the reconstruction technique solely to existing

physical objects that have to be measured. By applying the system of Knaell in the context of the teachings of Spencer, the overall capabilities of the system of Knaell are increased, which is a clear benefit. Furthermore, at the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically use the maximum entropy method for Bayesian reconstruction, as taught by Spencer. The motivation for doing so would have been that the maximum entropy method provides a significant improvement in resolution, and thus in the ability to detect/distinguish closely spaced objects (column 5, lines 17-21 of Knaell). Therefore, it would have been obvious to combine Spencer with Knaell to obtain the invention as specified in claim 1.

Regarding claim 2: Knaell discloses that the Bayesian reconstruction is performed using a Fourier basis (column 5, equation 4 and lines 63-65 of Knaell).

Regarding claim 5: Knaell discloses employing an evaluation parameter, α, which is determined from a prior reconstruction (column 5, line 66 to column 6, line 2 and column 6, equation 3 of Knaell). Whether the evaluation parameter is referred to as α or a_i is merely a matter of nomenclature.

Regarding claim 6: Knaell discloses employing an evaluation parameter, α, which is set at a fixed value (column 5, line 66 to column 6, line 2 and column 6, equation 3 of Knaell). Whether the evaluation parameter is referred to as α or a_i is merely a matter of nomenclature.

Regarding claim 7: Knaell discloses employing an evaluation parameter, α, which is determined during the reconstruction step (column 5, line 66 to column 6, line 2 and column 6,

equation 3 of Knaell). Whether the evaluation parameter is referred to as α or a_i is merely a matter of nomenclature.

Regarding claim 8: Knaell discloses that the signal to be reconstructed is an image signal (column 5, lines 53-60 of Knaell). By combination with Spencer, the signal is the previously produced signal, as set forth in the arguments regarding claim 1.

Regarding claim 10: Knaell discloses that the signal to be reconstructed is a radar signal (column 4, lines 64-66 of Knaell). By combination with Spencer, the signal is the previously produced signal, as set forth in the arguments regarding claim 1.

6. Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knaell (US Patent 5,394,151), Spencer (US Patent 5,535,291), and Clarke (US Patent 5,799,100).

Regarding claim 3: Knaell and Spencer does not disclose expressly that the Bayesian reconstruction is performed using a wavelet basis.

Clarke discloses reconstruction of images using a wavelet basis (column 10, lines 60-67 of Clarke).

Knaell and Spencer are combinable with Clarke because they are from the same field of endeavor, namely the reconstruction of images. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a wavelet basis, as taught by Clarke, rather than a Fourier basis, as taught by Knaell. The suggestion for doing so would have been that a directional wavelet transform has a corresponding Fourier transform (column 9, lines 17-30 of Clarke), and thus a wavelet transform is an alternate transform method for image signal

data. Therefore, it would have been obvious to combine Clarke with Knaell and Spencer to obtain the invention as specified in claim 3.

Regarding claim 9: Knaell and Spencer does not disclose expressly that said image signal is a medical image signal.

Clarke discloses reconstructing an medical image signal (column 11, lines 36-42 of Clarke).

Knaell and Spencer is combinable with Clarke because they are from the same field of endeavor, namely the reconstruction of images. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically reconstruct a medical image, as taught by Clarke. The suggestion for doing so would have been that the system of Knaell is applicable to 3-dimensional image reconstruction in general. A medical image signal is simply another type of image that can be reconstructed. Therefore, it would have been obvious to combine Clarke with Knaell and Spencer to obtain the invention as specified in claim 9.

7. **Claims 11-12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knaell (US Patent 5,394,151), Spencer (US Patent 5,535,291), and Hofstein (US Patent 4,099,179).**

Regarding claims 11-12: Knaell and Spencer does not disclose expressly that the previously produced signal to be reconstructed is an acoustic data signal, wherein the acoustic data signal is an underwater sonar signal.

Hofstein discloses reconstructing an acoustic data signal (column 7, lines 22-30 of Hofstein), wherein said acoustic data signal is an underwater sonar signal (column 7, lines 9-15 of Hofstein).

Knaell and Spencer is combinable with Hofstein because they are from the same field of endeavor, namely digital image data processing and display. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use sonar signals as the input signal for image reconstruction, as taught by Hofstein. The motivation for doing so would have been to obtain information regarding objects and events below the surface of the water (column 7, lines 9-12 of Hofstein). Therefore, it would have been obvious to combine Hofstein with Knaell and Spencer to obtain the invention as specified in claims 11-12.

Regarding claim 15: Knaell does not disclose expressly that the previously produced signal is a communication signal.

Hofstein discloses processing a radio signal (column 6, lines 65-68 of Hofstein), which is a form of communication signal.

Knaell and Spencer are combinable with Hofstein because they are from the same field of endeavor, namely digital image data processing and display. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a communication signal as the signal to process, as taught by Hofstein. The motivation for doing so would have been to scan target objects based on the return echoes of said communication signals (column 6, lines 63-65 of Hofstein). Therefore, it would have been obvious to combine Hofstein with Knaell and Spencer to obtain the invention as specified in claim 15.

8. Claims 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knaell (US Patent 5,394,151), Spencer (US Patent 5,535,291), Hofstein (US Patent 4,099,179), and Bahorich (US Patent 5,226,019).

Regarding claim 13: Knaell, Spencer and Hofstein does not disclose expressly that the acoustic data signal is a geophysical data signal.

Bahorich discloses processing geophysical data signals (column 3, lines 60-61 and column 4, lines 6-10 of Bahorich).

Knaell, Spencer and Hofstein is combinable with Bahorich because they are from the same field of endeavor, namely digital image data processing and display. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically acquire and process geophysical data, as taught by Bahorich. The motivation for doing so would have been to obtain information about the Earth's structure, lithology, geology, and pore fluid content (column 2, lines 53-57 of Bahorich). Therefore, it would have been obvious to combine Bahorich with Knaell, Spencer and Hofstein to obtain the invention as specified in claim 13.

Regarding claim 16: Knaell, Spencer and Hofstein does not disclose expressly that the communication signal is a time-series signal.

Bahorich discloses processing a time-series signal (column 2, lines 53-57 of Bahorich).

Knaell, Spencer and Hofstein is combinable with Bahorich because they are from the same field of endeavor, namely image data processing and display. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically use a time-series signal, as taught by Bahorich.

The motivation for doing so would have been that time-series signals are useful for extracting a variety of information (column 2, lines 53-57 of Bahorich). Therefore, it would have been obvious to combine Bahorich with Knaell, Spencer and Hofstein to obtain the invention as specified in claim 16.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knaell (US Patent 5,394,151), Spencer (US Patent 5,535,291), and Larson (US Patent 5,252,922).

Regarding claim 14: Knaell and Spencer does not disclose expressly that the previously produced signal to be reconstructed is a signal from spectroscopy.

Larson discloses reconstructing images from spectroscopy (column 4, lines 25-31 of Larson).

Knaell and Spencer is combinable with Larson because they are from the same field of endeavor, namely digital image data processing and display. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically use spectroscopic imaging, as taught by Larson. The motivation for doing so would have been that spectroscopy can provide spatially resolved discrimination of medical tissue images (column 4, lines 30-35 of Larson). Therefore, it would have been obvious to combine Larson with Knaell and Spencer to obtain the invention as specified in claim 14.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

James A. Thompson
Examiner
Technology Division 2625

07 September 2006

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